Candidate evidence

Question 1   Candidate 1

1. A school year in Scotland usually lasts 190 days.

   Estimate the total number of hours that a typical pupil in Scotland will spend in school during their lifetime.

   State any further assumptions you make.   3

ASSUMPTIONS:
- Pupils leave at 55
- School year is consistently 190 days
- Pupil goes to school the entire year
- School days are 24 hours
- 24 hours in a day
- Primary lasts 7 years

$7 + 5 = 12$

$\times 190 = 2.47 \times 10^3 = 659,280$ hours
$\times 24$

Question 1   Candidate 2

1. A school year in Scotland usually lasts 190 days.

   Estimate the total number of hours that a typical pupil in Scotland will spend in school during their lifetime.

   State any further assumptions you make.   3

   Assumptions
   - A typical School pupil will attend both Primary school and high school.
   - There are 7 school years in Primary school and 6 School years in high school.
   - A typical school pupil will take 15 day off during a school year for illness, holidays, etc.
   - The average school day lasts for around 7 hours.

   (190-15)
   ~~190~~ × 13 = 2275 Days
   2275 × 7 = <u>15925 hours</u>

   The typical pupil in Scotland will spend around 15925 hours in school during their life-time.

Question 2(a)   Candidate 3

(a) Complete the PERT chart below to allow the contestant to determine the earliest start time and latest completion time for each task.   6

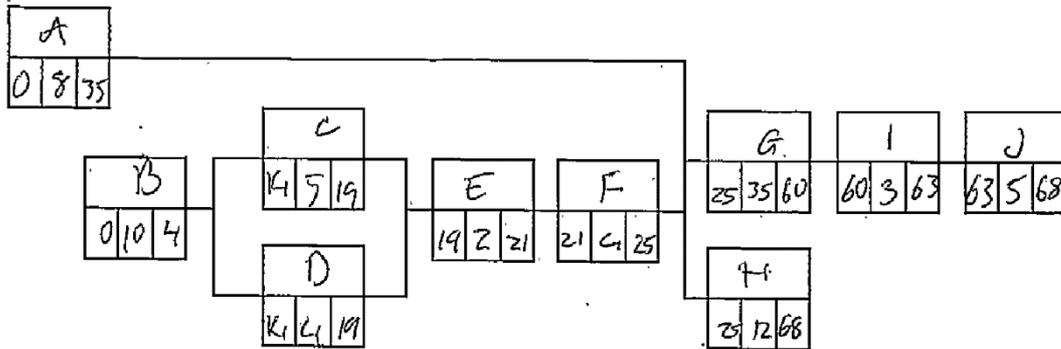(An additional diagram, if required, can be found on *page 16*.)

Question 2(a)   Candidate 4

(a) Complete the PERT chart below to allow the contestant to determine the earliest start time and latest completion time for each task.   6

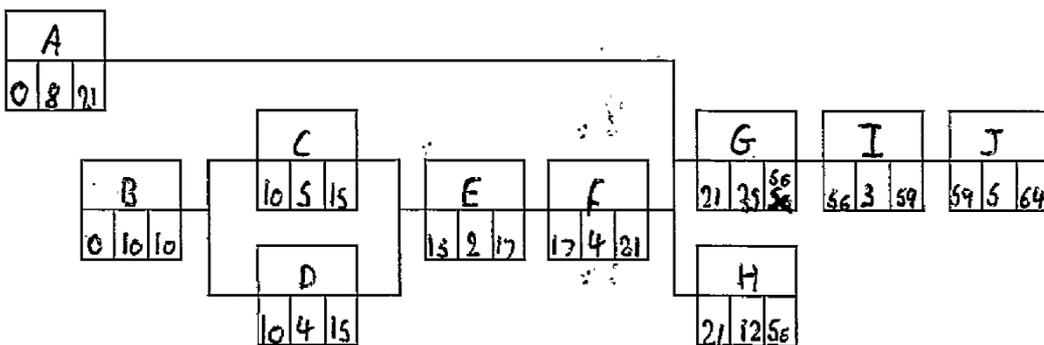(An additional diagram, if required, can be found on *page 16*.)

Question 3(a)(i)   Candidate 5

(a) State the type of data that best describes

   (i) age   **1**

   numerical

Question 3(a)(ii)   Candidate 6

(ii) gender.   1

Categorical

Question 3(b)   Candidate 7

(b) Give two reasons why these results do not provide a representative sample of the national population to allow the prediction to be accurate.   2

The survey is only sent out to People who live in Renfrewshire and is carried out online and some people may not have acess to technology,

Question 3(b)   Candidate 8

(b) Give two reasons why these results do not provide a representative sample of the national population to allow the prediction to be accurate.   **2**

• Due to being in one small area, this does not reflect the national population, different people in different areas will vote a certain way for certain reasons.
• People's preference could change greatly between the survey and election due to the political climate and therefore the result is hard to predict.

Question 4   Candidate 9

4. | You must refer to the information on 'Scottish Tax Bands 2022/23' given in the pre-release material when answering this question.

James works for a large building company. He is a permanent employee and earns a gross annual salary of £36,700.

James pays 4.7% of his gross annual salary into his pension and pays £3071.45 National Insurance per annum.

Calculate his net annual salary after all deductions.   4

4.7% of £36,700 = £1724.90
36700 - 1724.90 = £34975.10

Tax Income	%	Tax payable
£12,570	0	£0
£2162	19	£410.78
£10956	20	£2191.20
£9287.10	21	£1950.29
£34975.10		£4552.27

Total Net annual salary = 36700 - 1724.90 + 3071.45 - 4552.27

= £27351.38

Question 4   Candidate 10

4. | You must refer to the information on 'Scottish Tax Bands 2022/23' given in the pre-release material when answering this question.

James works for a large building company. He is a permanent employee and earns a gross annual salary of £36,700.

James pays 4.7% of his gross annual salary into his pension and pays £3071.45 National Insurance per annum.

Calculate his net annual salary after all deductions.   4

STARTER - 14,732 - 12,570 =
   2,162 × 0.19 = £410.78

BASIC - 25,688 - 14,732 = +
   10,956 × 0.2 = £2,191.20

INTERMEDIATE - 43,662 - 25,688 = +
   £17,974 × 0.21 = £3,774.54

gross
   36,700
NI   −
   3,071.45
Pension   +
   1,724.90
Income tax +
   6,376.52

= £25,527.13

Question 5(a)   Candidate 11

(a)

Statistical software output:

scatterplot of Carbohydrate content on Number of calori

Question 5(a)   Candidate 12

(a)

Statistical software output:

Calories On Carbohydrate Content

● Number of Calories   ○ Carbohydrate Content

Question 5(b)(i)   Candidate 13

(b)   (i)

Statistical software output: 0.9628262

Answer:

Question 5(b)(i)   Candidate 14

(b)   (i)

> *Statistical software output:*
> data: Carbohydrate.Content and Number.of.Calories
> t = 15.941, df = 20, p-value = 7.8e-13
> alternative hypothesis: true correlation is not equal to 0
> 95 percent confidence interval:
> 0.9110422 0.9847070
> sample estimates:
>   cor
> 0.9628262

> *Answer:*
> The relationship between the carbohydrate content and number of calories is statistically significant as the p-value (7.8e-13) is less than 0.05.

Question 5(b)(ii)   Candidate 15

> *Answer:* From this we can see the confidence interval doesn't cross 0 from this we can be 95% sure that there is a significant difference between the Number of calories and the Carbohydrate content. The p-value is also less than >0.05 meaning it is a weak linear relationship.

Question 5(b)(ii)   Candidate 16

.(b)   (i)

> *Statistical software output:*
> cor.test(Carbohydrate.Content,Number.of.Calories)
>
> ---
>
> *Answer:*
> The correlation coefficient is 0.96282.62.
> This implies that there is a strong positive relationship between
> Carbohydrate Content and Number of Calories.

Question 5(c)(i)   Candidate 17

(c)   (i)

> *Statistical software output:*
> lm(Number.of.Calories~Carbohydrate.Content)
>
> Call:
> lm(formula = Number.of.Calories ~ Carbohydrate.Content)
>
> Coefficients:
>   (Intercept) Carbohydrate.Content
>   73.65   4.65
>
> ---
>
> *Answer:*
> Y=mx+C
> Number.Of.Calories = 4.65(Carbohydrate.Content) + 73.65

Question 5(c)(i)　　　　　　　　**Candidate 18**

Statistical software output:
```
 Call:
lm(formula = Number.of.Calories ~ Carbohydrate.Content)

Coefficients:
        (Intercept)    Carbohydrate.Content
            73.65                    4.65
```
Answer:

Y= 4.65(X)+73.65

Question 5(c)(ii)　　　　　　　　**Candidate 19**

(ii)

Answer:
The Paramaters of the graph, the y intercept is at 73.65, this means that the graph cuts through the y axis at 73.65, after that it will become out of bounds on the graph. The gradient of the line on the graph is 4,65, this means the line goes upwards as it's a positive gradient, 4,65 means that the gradient is quite big and increases majorly.

Question 5(c)(ii)   Candidate 20

(ii)

Answer:
The slope of 4.65 means that for every gram of Carbohydrate in the drink the number of calories increase by 4.65 kCal.

The intercept of 73.65 means that when the Carbohydrate content is 0 g the number of calories in the drink is 73.65 kCal.

Question 5(d)   Candidate 21

(d)

Answer:
330 calories

Question 5(d)   Candidate 22

(d)

Answer: approximately 350 calories

Question 5(d)   Candidate 23

(d)

Answer:
         fit   lwr   upr
1 348.0205 294.3811 401.6598

The fit shows that the number of calories in a drink with 59g of carbohydrates is 348 or somewhere in between 294.38 and 401.66

Question 6(a)   Candidate 24

(a) State the critical path for this project.

A – B – C – F – G

Question 6(a)   Candidate 25

(a) State the critical path for this project.

A, C, F, G

Question 6(b)   Candidate 26

(b) State the duration of the float time for activity B.

3   hours

Question 6(c)   Candidate 27

(c) State one **advantage** of using a Gantt chart.

You can see the critical path straight away

Question 6(c)   Candidate 28

(c) State one advantage of using a Gantt chart.

you are able to visualise
cleary the duration of
         activities, and
the earliest time they
                    can
                    start

Question 7(a)   Candidate 29

Taylor makes further deposits of £200 on 1 August 2021 and £250 on 1 April 2022.

(a) Calculate the balance in Taylor's savings account on 31 July 2022.   4

$$400 \times 1.012^{10/12} + 200 = 603.99$$

$$603.99 \times 1.0011^{6} + 250 = 857.98$$

$$= 857.98$$

Question 7(a)   Candidate 30

Taylor makes further deposits of £200 on 1 August 2021 and £250 on 1 April 2022.

(a) Calculate the balance in Taylor's savings account on 31 July 2022.   4

1 April 21 - 400

1 Aug 21 - 200

1 April 22 - 250

$400 \times (1.012)^{\frac{4}{12}} = 401.593...$

$+ 200 = 601.593...$ 3/Jan 2022

$601.593... \times (1.012)^2 = 616.1185...$

$616.1185... \times (1.0011)^3 = 618.153...$

$+250 = 868.1539... \times (1.0011)^4$

$= £871.90$

Question 7(b)   Candidate 31

Taylor made a **final** deposit into this account on 1 August 2022.
On 1 December 2022, their savings account balance was £1000.

(b) Calculate how much they deposited on 1 August 2022.   2

$£1000 \div 1.017^{\frac{4}{12}}$

$= 994.39 - 885.58$

$= £108.81$

Question 7(b)   Candidate 32

Taylor made a **final** deposit into this account on 1 August 2022.

On 1 December 2022, their savings account balance was £1000.

(b) Calculate how much they deposited on 1 August 2022.   **2**

$$1000 \div 1.017^{\frac{5}{12}} = \text{\texteuro}993$$

$$993 - 860.30 = \text{\texteuro}132.70$$

Question 8(a)   Candidate 33

5	Warehouse Stock Prediction	
6		
7	Initial number of units of stock (week 0)	1750
8	Percentage of stock remaining at end of week	80%
9	Number of units of new stock per week	300
10	Number of units of stock at the end of week 26	1501
11		
12	End of week	Number of units of stock
13	0	1750
14	1	1700
15	2	1660
16	3	1628
17	4	1602
18	5	1582
19	6	1566
20	7	1552
21	8	1542
22	9	1534
23	10	1527
24	11	1521
25	12	1517
26	13	1514
27	14	1511
28	15	1509
29	16	1507
30	17	1506
31	18	1505
32	19	1504
33	20	1503
34	21	1502
35	22	1502
36	23	1501
37	24	1501
38	25	1501
39	26	1501

Question 8(a)   Candidate 34

5	Warehouse Stock Prediction			
6				
7	Initial number of units of stock (week 0)	1750		
8	Percentage of stock remaining at end of week.	80%		
9	Number of units of new stock per week	300		
10	Number of units of stock at the end of week 26	1500.756		
11				

	End of week	Number of units of stock
12		
13	0	1750.000
14	1	1700.000
15	2	1660.000
16	3	1628.000
17	4	1602.400
18	5	1581.920
19	6	1565.536
20	7	1552.429
21	8	1541.943
22	9	1533.554
23	10	1526.844
24	11	1521.475
25	12	1517.180
26	13	1513.744
27	14	1510.995
28	15	1508.796
29	16	1507.037
30	17	1505.629
31	18	1504.504
32	19	1503.603
33	20	1502.882
34	21	1502.306
35	22	1501.845
36	23	1501.476
37	24	1501.181
38	25	1500.944
39	26	1500.756

5	Warehouse Stock Prediction	
6		
7	Initial number of units of stock (week 0)	1750
8	Percentage of stock remaining at end of week	0.8
9	Number of units of new stock per week	300
10	Number of units of stock at the end of week 26	=C39
11		
12	End of week	Number of units of stock
13	0	=C7
14	1	=(C13-(C13*0.2)+300)
15	2	=(C14-(C14*0.2)+300)
16	3	=(C15-(C15*0.2)+300)
17	4	=(C16-(C16*0.2)+300)
18	5	=(C17-(C17*0.2)+300)
19	6	=(C18-(C18*0.2)+300)
20	7	=(C19-(C19*0.2)+300)
21	8	=(C20-(C20*0.2)+300)
22	9	=(C21-(C21*0.2)+300)
23	10	=(C22-(C22*0.2)+300)
24	11	=(C23-(C23*0.2)+300)
25	12	=(C24-(C24*0.2)+300)
26	13	=(C25-(C25*0.2)+300)
27	14	=(C26-(C26*0.2)+300)
28	15	=(C27-(C27*0.2)+300)
29	16	=(C28-(C28*0.2)+300)
30	17	=(C29-(C29*0.2)+300)
31	18	=(C30-(C30*0.2)+300)
32	19	=(C31-(C31*0.2)+300)

Question 8(b)   Candidate 35

Warehouse Stock Prediction	
Initial number of units of stock (week 0)	1750
Percentage of stock remaining at end of week	80%
Number of units of new stock per week	300
Number of units of stock at the end of week 26	1799.563225

End of week	Number of units of stock
0	1750
1	1758.333333
2	1765.277778
3	1771.064815
4	1775.887346
5	1779.906121
6	1783.255101
7	1786.045918
8	1788.371598
9	1790.309665
10	1791.924721
11	1793.270601
12	1794.392167
13	1795.326806
14	1796.105672
15	1796.754726

Number of units of stock

Candidate extended worksheet to week 52

Question 8(b)   Candidate 36

	End of week	Number of units of stock
5	Warehouse Stock Prediction	
6		
7	Initial number of units of stock (week 0)	1750
8	Percentage of stock remaining at end of week	80%
9	Number of units of new stock per week	300
10	Number of units of stock at the end of week 26	1501
11		
12	**End of week**	**Number of units of stock**
13	0	1750
14	1	1700
15	2	1660
16	3	1628
17	4	1602
18	5	1582
19	6	1566
20	7	1552
21	8	1542
22	9	1534
23	10	1527
24	11	1521
25	12	1517
26	13	1514
27	14	1511
28	15	1509
29	16	1507
30	17	1506
31	18	1505
32	19	1504
33	20	1503
34	21	1502
35	22	1502
36	23	1501
37	24	1501
38	25	1501
39	26	1501
40	27	1501
41	28	1500
42	29	1500
43	30	1500
44	31	1500
45	32	1500
46	33	1500
47	34	1500
48	35	1500
49	36	1500
50	37	1500
51	38	1500
52	39	1500
53	40	1500
54	41	1500
55	42	1500
56	43	1500
57	44	1500
58	45	1500

Number of units of stock at the end of the week

Question 9(a)   Candidate 37

9. The Consumer Price Index (CPI) in the UK in April 2021 was 110.4, relative to a baseline of 100 in April 2015.

   (a) Explain what this figure means in terms of relative purchasing power.   1

   $$\frac{110.40}{100} - 1 \times 100 = 10.4\% \text{ increase}$$

Question 9(a)   Candidate 38

9. The Consumer Price Index (CPI) in the UK in April 2021 was 110.4, relative to a baseline of 100 in April 2015.

    (a) Explain what this figure means in terms of relative purchasing power.   1

    > This figure means that inflation has caused a raise in prices meaning that consumers are spending more money.

Question 9(a)   Candidate 39

9. The Consumer Price Index (CPI) in the UK in April 2021 was 110.4, relative to a baseline of 100 in April 2015.

    (a) Explain what this figure means in terms of relative purchasing power.   1

    > The relative purchasing power of => Products Products are more expensive, so can buy less with £z -

Question 9(b)   Candidate 40

The price of a new 3-door car rose in line with CPI between April 2015 and April 2021.

In 2021, the price of a new 3-door car was £14,108.

(b)   Calculate the price of a new 3-door car in April 2015.

14,108 ÷ 100 × 10.4 = ~~1,467.23~~

14,108 + 1,467.23 = ~~£15,575.23~~

14,108 − 1,467.23 = £12,640.77

Question 9(b)   Candidate 41

The price of a new 3-door car rose in line with CPI between April 2015 and April 2021.

In 2021, the price of a new 3-door car was £14,108.

(b)   Calculate the price of a new 3-door car in April 2015.

110.4 ÷ 100 = ~~1,104~~ 1,104

14108 ÷ 1.104 = 12778.99

~~= 12778.99~~

Question 9(c)   Candidate 42

The National Living Wage is the minimum hourly rate to be paid to any employee aged 23 or older.

In April 2021, the National Living Wage was £8.91. This was raised to £9.50 in April 2022.

(c) Given that the CPI in April 2022 was 119.0, determine whether this rise in the National Living Wage was in line with inflation.

$$\frac{9.50}{8.91} - 1 = 0.06621\ldots$$
$$= 0.066 \quad \times 100$$
$$= 6.62\%$$

April 2021 had lower CPI.

- It rose 6.62% from April 2021 to April 2022

Question 9(c)   Candidate 43

The National Living Wage is the minimum hourly rate to be paid to any employee aged 23 or older.

In April 2021, the National Living Wage was £8.91. This was raised to £9.50 in April 2022.

(c)   Given that the CPI in April 2022 was 119.0, determine whether this rise in the National Living Wage was in line with inflation.

$$119 - 110.4 = 8.6 \qquad 7.2 \leftarrow \text{infation}$$
$$6.21 \leftarrow \text{money}$$

NO, the money needs to be raised more.

Question 10(a)(i)   Candidate 44

10. | You must refer to the information on 'E10 Petrol' given in the pre-release material when answering this question.

At the end of June 2021, the UK government replaced the standard E5 fuel with E10 in a bid to reduce national CO_2 emissions.

A newspaper article stated that:

'Since the nationwide introduction of E10 fuel, CO_2 emissions have reduced to the effect of taking 550 000 cars off the road by the end of 2022.'

(a) (i) Calculate the CO_2 emissions of 550 000 cars.   1

350,000 cars — 750 000 ÷ 350 000

1 — 2.142...

550 000 — 1178571.43

Question 10(a)(i)   Candidate 45

10. You must refer to the information on 'E10 Petrol' given in the pre-release material when answering this question.

At the end of June 2021, the UK government replaced the standard E5 fuel with E10 in a bid to reduce national CO_2 emissions.

A newspaper article stated that:

'Since the nationwide introduction of E10 fuel, CO_2 emissions have reduced to the effect of taking 550 000 cars off the road by the end of 2022.'

(a) (i) Calculate the CO_2 emissions of 550 000 cars.   1

$$750\ 000 = 350\ 000$$
$$\div$$
$$0.46 \times 550\ 000$$
$$= 256\ 666.6\ \text{Tones}$$

Question 10(a)(ii)   Candidate 46

(ii) Suggest a reason why the information from the newspaper article might not be appropriate as part of any further research on reducing CO_2 emissions.   1

Does not improve air quality for people + public health

Question 10(a)(ii)   Candidate 47

(ii) Suggest a reason why the information from the newspaper article might not be appropriate as part of any further research on reducing CO_2 emissions.

As the cars may not be off the roads by 2022 or may take longer.

Question 10(b)(i)   Candidate 48

The fuel economy of a car, F miles per gallon (mpg), is reduced when it carries an additional load of m kilograms.

The fuel economy of a small car is modelled using the following equation:

$$F = 73.6 \times 0.98^{\frac{m}{45}}$$

(b) (i) State the independent variable.   1

kg

Question 10(c)   Candidate 49

(c) Explain which graph could model the depth of petrol in the tank.   **2**

A, It will initimamy fall fuster slower In the middle of the graph, then y reduce faster again, than Graph A is Inline With what we expect to See

Question 10(c)   Candidate 50

(c) - Explain which graph could model the depth of petrol in the tank.   **2**

Graph A models the depth of petrol in the tank as it shows that the depth rate of the depth getting higher slows down when the petrol is filling the curve of the Hemisphere. As it reaches the peak of the Hemisphere the depth rate of the depth getting higher increases.

Question 11(a)(i)(ii)   Candidate 51

		Repayment (£)	Interest content of repayment (£)	Capital content of repayment (£)	Loan outstanding (£)
5	Bank loan repayment schedule				
6	Initial loan amount	£6,000.00			
7	Annual effective interest rate	6.3%			
8	Monthly effective interest rate	0.510%			
9	Loan period (years)	3			
10	Monthly repayment amount	£182.87			
11	Final repayment amount	£182.87			
12					
13	Total interest paid	£583.39			
14					
15	Time (months)	Repayment (£)	Interest content of repayment (£)	Capital content of repayment (£)	Loan outstanding (£)
16	0				6,000.00
17	1	£182.87	£30.63	£152.24	5,847.76
18	2	£182.87	£29.85	£153.02	5,694.73
19	3	£182.87	£29.07	£153.80	5,540.93
20	4	£182.87	£28.28	£154.59	5,386.34
21	5	£182.87	£27.49	£155.38	5,230.97
22	6	£182.87	£26.70	£156.17	5,074.80
23	7	£182.87	£25.90	£156.97	4,917.83
24	8	£182.87	£25.10	£157.77	4,760.06
25	9	£182.87	£24.30	£158.57	4,601.49
26	10	£182.87	£23.49	£159.38	4,442.11
27	11	£182.87	£22.67	£160.20	4,281.91
28	12	£182.87	£21.86	£161.01	4,120.89
29	13	£182.87	£21.03	£161.84	3,959.06
30	14	£182.87	£20.21	£162.66	3,796.40
31	15	£182.87	£19.38	£163.49	3,632.90
32	16	£182.87	£18.54	£164.33	3,468.58
33	17	£182.87	£17.70	£165.17	3,303.41
34	18	£182.87	£16.86	£166.01	3,137.40
35	19	£182.87	£16.01	£166.86	2,970.55
36	20	£182.87	£15.16	£167.71	2,802.84
37	21	£182.87	£14.31	£168.56	2,634.28
38	22	£182.87	£13.45	£169.42	2,464.85
39	23	£182.87	£12.58	£170.29	2,294.56
40	24	£182.87	£11.71	£171.16	2,123.41
41	25	£182.87	£10.84	£172.03	1,951.37
42	26	£182.87	£9.96	£172.91	1,778.46
43	27	£182.87	£9.08	£173.79	1,604.67
44	28	£182.87	£8.19	£174.68	1,429.99
45	29	£182.87	£7.30	£175.57	1,254.42
46	30	£182.87	£6.40	£176.47	1,077.95
47	31	£182.87	£5.50	£177.37	900.59
48	32	£182.87	£4.60	£178.27	722.31
49	33	£182.87	£3.69	£179.18	543.13
50	34	£182.87	£2.77	£180.10	363.03
51	35	£182.87	£1.85	£181.02	182.02